

CM I Claim:

1. A method of optimizing the implementation of a piezoelectric resonator-based network, comprising the following steps:

5 decomposing an original resonator in the network into a pair of series connected resonators to add an additional electrode to the network;

10 connecting the pair of resonators to a shared electrode to be mounted to a surface of the piezoelectric material;

placing the additional electrode on a surface of the piezoelectric material opposing the surface to which the shared electrode is mounted; and

15 matching the composite characteristics of the series connected resonators with those of the original resonator to preserve the original characteristics of the network.

2. The method of claim 1 in which the piezoelectric resonator has first and second electrodes on
20 opposing surfaces of the piezoelectric material, and the added electrode is placed on the same surface of the piezoelectric material as the first electrode is placed.

3. The method of claim 1 in which decomposing an original resonator comprises:

25 locating a piezoelectric resonator in the network; and

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A. I.

B replacing the resonator with two series connected resonators ^{which} are connected only to each other at the shared electrode.

4. The method of claim 1 in which matching the composite characteristics of the series connected resonators with those of the original resonator comprises:

placing two electrodes on one surface of the piezoelectric material; and

placing the shared electrode on the other surface of the material in overlapping relation to the two electrodes to create the pair of series connected resonators.

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Toyoshima 15 Sub 5. The method of claim 4 in which the electrodes are placed to create ^B two series connected resonators each with twice the capacitance of the original resonator.

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Sub C7 6. A piezoelectric resonator comprising:
a layer of piezoelectric material;
a pair of electrodes mounted on one surface of the piezoelectric material; and
20 a third electrode mounted on an opposing surface of the piezoelectric material,

each electrode of the pair mounted in overlapping relation to the third electrode to create two series connected resonators that are connected ^{the only connection} only to ~~each other at the~~ third electrode.
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sub 6437 7. The piezoelectric resonator of claim 6 in which the two series-connected resonators have equal capacitance.

10. 8. The piezoelectric resonator of claim 8 in which each electrode of the pair is for connection to other circuitry.

sub B447 9. A piezoelectric resonator-based T network comprising:

10 a pair of series connected piezoelectric resonators sharing a first electrode;
a shunt element connected to the first electrode and to a signal ground; and
a third piezoelectric resonator series connected to one of the pair of series connected resonators or to
15 the shunt element at a second electrode,
the third resonator and the piezoelectric resonator or the third resonator and the shunt element being the only connections to the second electrode.

2. 16. The piezoelectric resonator-based network of
20 claim 16 in which the shunt element comprises a piezoelectric resonator.

3. 17. The piezoelectric resonator-based network of claim 17 in which the third resonator is series connected to one of the pair of series connected resonators to place
25 electrodes on opposing surfaces of the piezoelectric material for connecting the network to other circuitry.

12. The piezoelectric resonator-based network of claim 9 in which the third resonator is series connected to the shunt element to place signal ground on an opposing surface of the piezoelectric material from other electrodes that connect the network to other circuitry.

4.13. A piezoelectric resonator-based pi network comprising:

a first pair of resonators sharing a first electrode for connection to other circuitry;

a second pair of resonators sharing a second electrode for connection to other circuitry; and

a series connected pair of resonators comprising a resonator from each of the first and second pairs and sharing a third electrode, the series connected pair being the only connections to the third electrode.

5.14. The piezoelectric resonator-based network of claim 11 in which the pair of series connected resonators place electrodes on the same surface of the piezoelectric material for connecting the network to other circuitry.

15. A piezoelectric resonator-based L network comprising:

a first resonator including a first electrode for connection to other circuitry;

a shunt element connected to the first resonator at the first electrode; and

a second resonator series connected to the first resonator or to the shunt element at a second electrode,

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the second resonator and the first resonator or
the second resonator and the shunt element being the only
connections to the second electrode.

16. The piezoelectric resonator-based network of
5 claim 15 in which the second resonator is series connected
to the first resonator to place electrodes on the same
surface of the piezoelectric material for connecting the
network to other circuitry.

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10 17. The piezoelectric resonator-based network of
claim 15 in which the shunt element comprises a third
piezoelectric resonator.

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